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ANTIPERSPIRANT AEROSOL COMPOSITIONS

This invention relates to antiperspirant aerosol  
5 compositions suitable for topical application to the human  
body and to methods of making the same.

Antiperspirant compositions suitable for topical application  
typically comprise an antiperspirant material such as  
10 aluminium chlorohydrate which acts to suppress the level of  
perspiration on the area of the body to which it is applied.  
Antiperspirant compositions are widely applied in the form  
of a pressurised, propellant driven aerosol spray.

15 Aerosol antiperspirant compositions typically have the  
antiperspirant material suspended in an anhydrous carrier  
fluid, together with a propellant and a suspending agent.  
Other minor ingredients can also be present, and the  
composition is housed in a pressurised container.

20

A major problem associated with all antiperspirants,  
including aerosol antiperspirants, is that of deposition or  
whitening where the antiperspirant active, which is usually  
in powder form, is deposited on a user's clothes or skin,  
25 thereby causing visible whitening/staining and occasionally  
damage to the clothes.

Various attempts have been made to reduce the whitening or  
visible deposits. A widely used approach has been to  
30 incorporate a masking oil such as an aliphatic hydrocarbon,  
ester oil, or silicone fluid into the formulation.

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The masking oil functions by coating the surface of the antiperspirant active particles and minimises the scattering of light, thereby rendering the active less visible to the naked eye.

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The masking method has been found to reduce whitening in stick and roll-on products. The reduction of whitening caused by aerosol compositions containing activated aluminium chlorohydrate (AACH) as the active is more  
10 difficult: This is in part due to the difficulty in matching the refractive index (RI) of the masking oil with that of AACH, as commercially available AACH does not have a continuous RI value throughout the particle. More particularly, AACH particles generally contain hollow cores,  
15 having an RI of 1.0 while the RI of the outer particle is in the region of 1.5 which results in visible whitening.

One approach to reducing the whitening problem with AACH aerosol compositions is described in US 5,840,289 (Hall),  
20 wherein the AACH is milled to reduce the number of particles having hollow cores and the resulting active is masked with a masking oil of appropriate RI.

The inventors have now discovered that good antiperspirancy  
25 and remarkably low whitening can be achieved with AACH aerosol compositions comprising milled AACH having non-hollow particles in combination with a masking oil of particularly high viscosity. The good antiperspirancy found with compositions of the invention may enable a lower amount  
30 of antiperspirant active to be used whilst still maintaining the antiperspirancy efficacy of a conventional aerosol

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antiperspirant composition having a higher level of antiperspirant active.

5 A further benefit that may be achieved by use of the present invention is the enhanced maintenance of the antiperspirant active on the skin. This enables reduced transfer of the antiperspirant active to clothes worn in close proximity to the skin, thereby reducing whitening of said clothes and helps to maintain the antiperspirant benefit sought by the  
10 consumer.

Thus, according to a first aspect of the invention, there is provided a suspension antiperspirant aerosol composition comprising milled activated aluminium chlorohydrate having  
15 non-hollow particles and a carrier fluid comprising a masking oil of viscosity  $10^3 \text{ mm}^2/\text{s}$  or greater.

According to a second aspect of the invention, there is provided a method of manufacture of a suspension  
20 antiperspirant aerosol composition, said method comprising the suspension of a milled activated aluminium chlorohydrate (AACH) having non-hollow particles in a carrier fluid comprising a masking oil of viscosity  $10^3 \text{ mm}^2/\text{s}$  or greater.

25 According to a third aspect of the invention, there is provided a method of reducing perspiration and giving low visible deposits comprising the application to the human body of a suspension antiperspirant aerosol composition comprising milled AACH having non-hollow particles and a

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carrier fluid comprising a masking oil of viscosity  $10^3$  mm<sup>2</sup>/s or greater.

Without wishing to be bound by theory, the applicant  
5 believes that the reduced white deposits obtained with antiperspirant compositions of the present invention is due to the particular morphology of the antiperspirant actives selected and their highly effective coating by the particularly high viscosity masking oils indicated.

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The chemical nature and preparation of AACH antiperspirant actives suitable for use in the present invention are described in GB 1,568,831, GB 1,597,497, GB 1,597,498, EP 6,738, EP 6,739, EP 7,191, EP 191,628, EP 256,832 and  
15 EP 491,395, the contents of which are incorporated herein by reference. The amount of AACH present in the compositions of the invention may be from 1 to 30% and particularly from 2 to 20%, the upper level of AACH preferably being 10% or less and especially being 5% or less, all percentages being  
20 by weight of the composition.

25

The AACH used in the present invention is milled and has non-hollow particles. Preferably, a high level of non-hollow AACH particulate material is present, the hollows in  
the particles comprising less than 40% of the total volume of the AACH. It is particularly preferred that the hollows comprise less than 20%, and especially less than 10%, of the total volume of the AACH. AACH in which hollows comprise less than 5% of the total volume of the active is most  
30 preferred. Measurement of the amount of non-hollow AACH

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particulate material may be performed by a suitable microscopy technique (e.g. SEM) in combination with suitable image analysis.

5 Suitably, the AACH used in the present invention has a continuous RI. The RI of the AACH is preferably between 1.52 to 1.57. The mean particle size of the AACH is preferably from 20 to 30 microns (measured as the D[4,3], using a light scattering technique). Typically the AACH is  
10 prepared by milling a sample having a mean particle size (measured as above) of from 50 to 150 micron and comprising hollow particles.

The masking oil used in the present invention has a  
15 particularly high viscosity, being of viscosity  $10^3 \text{ mm}^2/\text{s}$  or greater. The viscosity values quoted in this specification are kinematic viscosities, measured at  $25^\circ\text{C}$ . A suitable method for measuring kinematic viscosities utilises a glass capillary viscometer, for example, as described in Dow  
20 Corning's Corporate Test Method CTM 0004, of July 29, 1970.

The masking oil may be any suitable oil of appropriate viscosity, examples including hydrocarbon oils, ester oils, and silicone oils. Suitable hydrocarbon oils include  
25 hydrogenated polyolefins, in particular hydrogenated polydecenes, examples including PureSyn oils of viscosity  $10^3 \text{ mm}^2/\text{s}$  or greater, such as PureSyn 1000 or 3000, available from Exxon-Mobil. Suitable silicone oils include linear and crosslinked polydimethylsiloxane (PDMS) fluids,

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examples including the DC200 PDMS fluids of viscosity  $10^3$  mm<sup>2</sup>/s or greater, available from Dow Corning.

The RI of the masking oil is preferably from 1.40 to 1.57.

5 Silicone oils are particularly preferred. The viscosity of the masking is  $10^3$  mm<sup>2</sup>/s or greater, preferably  $10^4$  mm<sup>2</sup>/s or greater, and more preferably 30,000 mm<sup>2</sup>/s or greater.

10 The masking oil may be used in an amount from 0.5% or 1%, up to 30%, in particular up to 10%, and especially up to 5%, all percentages being by weight of the total composition.

The masking oil may function as an emollient oil and/or lubricant. It may also serve to facilitate uniform  
15 distribution of the antiperspirant material on the skin.

The carrier fluid is any oil suitable for suspending ACH and compatible with the masking oil comprising it. Typically, the carrier fluid is present at a level of from 1 to 30%, in  
20 particular from 2 to 20%, and especially from 5 to 10% by weight of the composition.

The carrier fluid may comprise an emollient oil, additional to any masking oil also having this function (*vide supra*).  
25 Suitable emollient oils are disclosed in US Patent Nos. 4,822,596 and 4,904,463, the disclosures of which are incorporated by reference herein. Preferred emollient oils are alkyl esters, such as PurSyn Ester 2E7 (neopentylglycol dihexanoate), ex Exxon-Mobil; benzoate esters such as  
30 Finsolv TN (Trade Mark), ex Finetex Inc.; hydrogenated

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polyalkenes, such as Panalane, ex Amoco and PureSyn PAO 2 (hydrogenated polydecene), ex Exxon-Mobil; PPG ethers, such as Fluid AP (PPG-14 butylether), ex Union Carbide; isopropyl palmitate; phenylsilicone; and isopropyl myristate.

5

It is particularly preferred that the carrier fluid comprises a volatile silicone fluid. Preferred volatile fluids include dimethyl cyclosiloxanes, such Dow Corning fluids DC244, DC245, DC344 and DC345. The combination of  
10 such materials and the masking oil may be used at a level of from 1 to 30%, in particular from 2 to 20%, and especially from 5 to 10% by weight of the composition.

In order to prevent caking or settling out of the  
15 antiperspirant salt from the carrier fluid, a bulking or suspending agent is preferably incorporated into the composition of the invention. The suspending agent is preferably hydrophobically treated montmorillonite clay such as a bentonite or a hectorite. One such commercially  
20 available clay is Bentone 38V, which is a hectorite clay available from NL Industries, Inc. The amount of clay in the composition of the invention may be from 0.2 to 5.0% by weight of the total composition.

25 A propellant gas is generally present as part of the compositions of the invention. Any liquefiable gas known in the art for use in propellant driven aerosol products may be used. Examples of suitable propellants include trichlorofluoromethane, trichlorotrifluoromethane,  
30 difluoroethane, propane, butane or isobutane or combinations thereof. When used, the amount of liquefied gas in the

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composition of the invention is typically from 5 to 95% and preferably from 30 to 90% by weight of the composition. Alternatively, compressed gas such as air, nitrogen, or carbon dioxide may be used as propellant.

5

Other minor ingredients which may be present in the compositions of the invention include:

- cosmetically acceptable carrier fluid components, such as straight and branched chain alcohols, for example,  
10 ethanol, isobutanol or isopropanol;
- deodorant active perfumes and deodorant compounds which can act as antimicrobial agents;
- hydrophobic oils, such as liquid paraffin oils;
- inorganic electrolytes, such as sodium chloride or sodium  
15 sulphate;
- other thickeners such as clays, silicas, for example, Aerosil 200 and hydroxypropyl celluloses such as Klucel;
- polar additives such as propylene carbonate or alcohol;
- skin feel improvers, such as talc and finely divided  
20 polyethylene such as Accumist B18;
- humectants, such as polyols, for example glycerol;
- perfumes;
- preservatives and antioxidants;
- skin benefit agents such as allantoin;
- 25 - colours;
- other cosmetic adjuncts conventionally employed in propellant driven aerosol products.

The compositions of the invention may be manufactured by a  
30 method comprising the suspension of a milled activated aluminium chlorohydrate (AACH) having non-hollow particles



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in a carrier fluid comprising a masking oil of viscosity  $10^3$  mm<sup>2</sup>/s or greater. Techniques employed in the manufacture of conventional suspension AP aerosol products may be employed. In a particular method of manufacture, the AACH is suspended in a pre-formed mixture comprising volatile silicone, masking oil, and perfume, and said suspension is then placed in an aerosol can, preferably made of aluminium or tinplate, and a propellant gas is added in a liquefied form.

10

### Examples

The compositions indicated in the Tables below were prepared in the following manner. The volatile silicone, other oil (silicone oil or hydrocarbon oil), and Bentone 38V were sheared together at 9000 rpm for 5 minutes using a Silverson L4RT mixer. The perfume was then added whilst shearing and shearing was continued for a further 2 minutes. Shearing was then discontinued and the AACH was dispersed in the mixture using a spatula. The mixture was then subjected to a further 5 minutes shearing using the Silverson L4RT mixer.

The whiteness scores were obtained using the following method. The fully formulated compositions were each sprayed directly onto black test cloths from a distance of 25 cm, using a standard spray nozzle and a duration of 5 seconds per cloth. After approximately one hour, the whiteness scores of the cloths were measured using an image analysis technique. The results were analysed using standard

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statistical techniques to give the average whiteness score from each composition and the 95% confidence limits.

Comparative examples are indicated by letter codes.

5

Compositional amounts are given as percentages by weight.

**Table 1: Compositions comprising 3% masking oil**

10

	Examples			
	A	B	C	1
<b>Components</b>				
A296 <sup>1</sup>	2	2	-	-
Alloxicol LR <sup>2</sup>	-	-	2	2
Bentone 38V <sup>3</sup>	0.5	0.5	0.5	0.5
Volatile silicone <sup>4</sup>	6.9	6.9	6.9	6.9
DC 200 (50) <sup>5</sup>	3	-	3	-
DC 200 (30,000) <sup>6</sup>	-	3	-	3
Fragrance	0.6	0.6	0.6	0.6
CAP 40 <sup>7</sup>	To 100	To 100	To 100	To 100
<b>Whiteness</b>				
Score:	1789	1397	1420	750
95% limits:	±145	±89	±64	±57

1. Conventional unmilled AACH, ex BK Giulini.
2. Milled AACH, ex BK Giulini.
3. Suspending agent, hectorite clay, ex NL Industries.
4. DC245, ex Dow Corning.
- 15 5. PDMS of viscosity 50 mm<sup>2</sup>/s, ex Dow Corning.
6. PDMS of viscosity 30,000 mm<sup>2</sup>/s, ex Dow Corning.
7. Propellant, proprietary mix of butane, isobutane and propane, ex. Calor.

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These results illustrate that use of a milled active having non-hollow particles (Alloxicol LR) and a masking oil having a particularly high viscosity (DC 200 (30,000 mm<sup>2</sup>/s) leads to a particularly low whiteness score (Example 1). Poorer (i.e. higher) whiteness scores were obtained when the composition comprised only one of the required features (Examples B and C) and an even poorer whiteness score was obtained when the composition comprised neither of the required features (Example A).

**Table 2: Compositions comprising 1% masking oil**

	Examples			
	D	2	3	4
<b>Components</b>				
Alloxicol LR <sup>1</sup>	2	2	2	2
Bentone 38V <sup>1</sup>	0.5	0.5	0.5	0.5
Volatile silicone <sup>1</sup>	8.9 <sup>2</sup>	8.9	8.9	8.9
DC 200 (50) <sup>1</sup>	1	-	-	-
DC 200 (1000) <sup>3</sup>	-	1	-	-
DC 200 (30,000) <sup>1</sup>	-	-	1	-
Puresyn 1000 <sup>4</sup>	-	-		1
Fragrance	0.6	0.6	0.6	0.6
CAP 40 <sup>1</sup>	To 100	To 100	To 100	To 100
<b>Whiteness</b>				
Score:	1429	1213	848	1064
95% limits:	±123	±210	±35	±8

1. As defined in Table 1.

2. Including a small amount of silicone gum (Q2-1501, ex Dow Corning).

3. PDMS of viscosity 1,000 mm<sup>2</sup>/s, ex Dow Corning.

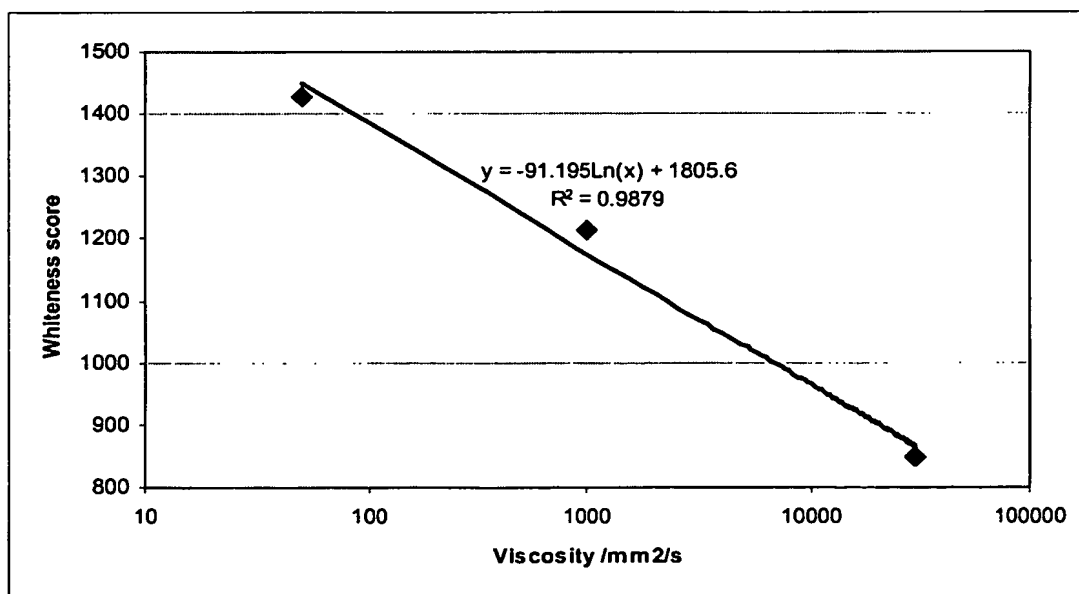
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4. Hydrogenated polydecene of viscosity  $42,300 \text{ mm}^2/\text{s}$ , ex Exxon-Mobil.

These results illustrate the benefit of using a masking oil  
5 of viscosity  $10^3 \text{ mm}^2/\text{s}$  or greater, whether the masking oil be a silicone oil or a hydrocarbon oil.

The results from silicone oil containing Examples D, 2, and  
3 are shown again in Figure 1, which suggests that a  
10 logarithmic-linear relationship between viscosity and whiteness score may be present.

**Figure 1: relationship between PDMS viscosity and whiteness score**



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Further Examples of compositions according to the invention are illustrated in Table 3.

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**Table 3**

	Examples			
	5	6	7	8
<b>Components</b>				
Alloxicol LR <sup>1</sup>	2	2	2	2
Bentone 38V <sup>1</sup>	0.5	0.5	0.5	0.5
Volatile silicone <sup>1</sup>	9	-	-	-
Finsolv TN <sup>2</sup>	-	8	-	8
PureSyn Ester 2E7 <sup>3</sup>	-	-	9	-
DC 200 (30,000) <sup>1</sup>	-	-	1	0.5
PureSyn 3000 <sup>4</sup>	1	1	-	0.5
Fragrance	0.6	0.6	0.6	0.6
CAP 40 <sup>1</sup>	To 100	To 100	To 100	To 100

1 As defined in Table 1.

5 2 C<sub>12-15</sub> alkyl benzoate, ex Finetex Inc.

3 Neopentylglycol dihexanoate, ex Exxon-Mobil.

4 Hydrogenated polydecene of viscosity 60,000 mm<sup>2</sup>/s, ex Exxon-Mobil.